

sufficiently nutritious food also results in poor returns of lambs. Among Suffolk and Shropshire ewes, which are highly fed as a rule, a high percentage of barrenness occurs in cases where they are excessively highly fed; on the other hand, among Dorset Horn, Lincoln, and Kent ewes, which are certainly not too highly fed as a rule at tupping time, the highest percentage of barrenness occurs among the poorest kept flocks.

The most frequent percentage of barrenness experienced in 327 flocks is 1 to 2 per cent., but, as Table III shows, the returns are much more irregular than was the case for abortion, and there is a much larger proportion of flocks in the "10 per cent. and over" column. The slightly excessive proportion of flocks in the 5 per cent. column suggests generalised results rather than accurate returns, but the number of flock-masters who are responsible for this is obviously very small.

In conclusion :—

1. Whereas the total loss from abortion and barrenness is fairly constant for most pure breeds of sheep, the Suffolks and Hampshires are markedly free from, and the Lincolns markedly liable to, heavy loss from these causes.

2. Although the loss from the above causes does exert an influence on the returns of fertility of the various breeds, it does not account for the wide variation which exists in this respect.

3. The ewes of certain pure breeds are conspicuously more fertile than the average cross-bred ewe; and

4. The fertility of certain pure breeds is sufficiently marked to constitute a racial characteristic.

"Some further Remarks on Red-water or Texas Fever." By
ALEXANDER EDINGTON, M.B., F.R.S.E., Director of the Bacteriological Institute, Cape Colony. Communicated by Dr. D.
GILL, C.B., F.R.S. Received March 13,—Read April 20, 1899.

Since my communication* to the Royal Society of London, by Professor Thomas R. Frazer, I have been able to obtain valuable addi-

* The conclusions arrived at in that communication (received June 6, 1898) were as follows :—

1. The blood of animals, themselves healthy, from a red-water area is dangerous if inoculated into an animal which suffers coincidentally from another disease.

2. That the blood of animals suffering from mild or modified red-water may be safely used to inoculate a healthy animal *subcutaneously*, but is dangerous when injected into a vein.

3. That the subcutaneous inoculation of mild or modified red-water blood conveys a mild form of the disease, and since the blood of such an animal is viru-

tional evidence as to the communicability of the disease by the use of blood derived from animals which have been either recovered from the sickness for a very considerable time or which have been inoculated many months previously to the date on which their blood has been used.

On the 8th December, 1898, I withdrew some blood from animal No. 18, which has been continuously under observation since it was inoculated on the 22nd December, 1897. After defibrinating the blood, 20 c.c. was used to inoculate a young ox (No. 54) by intravenous injection. On the following day a sharp rise of temperature occurred, which reached to 106.6 F. On the following morning it was observed to have fallen to 99.8° F. Three days later the temperature was again over 104° F., but fell previous to the next morning. From this time onward an erratic course of temperature was observed, and on the twenty-fifth day, subsequent to inoculation, it was seen to be ill, refused food, but had no definite symptoms of "red-water." Three days later it died. The blood on examination was seen to contain the spherical forms of the parasite.

On post-mortem examination, the bladder and urine were quite normal. The liver was not enlarged, but was somewhat discoloured in patches, and the biliary ducts were distended with bile. The bile was much altered, being stringy and of a greenish-yellow colour. The spleen was normal in size and consistence. The kidneys were enlarged and the pelves were filled up by a yellowish gelatinous exudation. The cortex was somewhat congested, but there was no evidence of any true inflammatory change. The general muscles were pale in colour, and there was slight evidence of jaundice. This experiment serves to show that an animal which has been inoculated with infected blood, while it may not develop much illness as a result of it, is really infected and, moreover, its blood, if drawn as late as a year subsequently, is yet so infective that an intravenous injection of it, into susceptible

lent when injected into a vein in another animal, it is safely to be inferred that the animal suffering from the mild form becomes more or less immunised or "salted."

On these grounds I would suggest a method of protective inoculation against red-water in the following manner. Having procured a healthy animal from a red-water area, or one which is known to have been "salted," inoculate it by injecting 5 c.c. of red-water blood into the jugular vein and 5 c.c. subcutaneously. In cases where the operator is unable to attempt the vein inoculation I would recommend the subcutaneous inoculation of 5 c.c. in four different sites.

Allow at least twenty-eight days to elapse, and if any degree of illness is recognised, the blood of this animal may be used, after being defibrinated, to inoculate healthy cattle. For such inoculation only 5 c.c. should be injected into small animals and not more than 10 c.c. into larger.

Seeing, however, that the presence of other maladies renders such a proceeding unsafe, I would recommend that it should only be practised during the autumn or winter, when the veld diseases are, as a rule, in abeyance, and in no case when any epidemic disease is in the near neighbourhood.

animals, will certainly infect, and may even kill, although after a somewhat extended period of time.

Very important corroboration of this is furnished by the experience of inoculation for red-water, which has lately been adopted in the Cape Colony. Four animals which were immune to red-water (three by reason of having had the disease and recovered, and one by being born and reared on permanently infected veld) were sent from Fort Beaufort to Queenstown to be used by the veterinary surgeon there for inoculation purposes. The animals to be used for inoculation had been "fortified," *i.e.*, re-inoculated with virulent blood, seven weeks previously.

Twenty animals were inoculated with defibrinated blood from one animal, the doses used being 10 to 20 c.c., according to age. All had a febrile reaction and some slight symptoms of the sickness, but easily recovered. From one of the other of the four animals blood was taken and used to inoculate seven head, giving doses of 10 to 15 c.c. These also all had a reaction, but made good recovery.

On November 1st the four animals were re-inoculated with virulent red-water blood, and in each case 5 c.c. was injected intravenously and 10 c.c. subcutaneously. Twenty-nine days later they were bled. With this blood two lots of cattle were inoculated.

One lot consisted of 107 animals which had not ever been exposed to red-water infection. The doses used were increased beyond those which I had recommended, namely, 10 to 25 c.c. were used, according to age. Of these animals no less than seventeen died of characteristic red-water. The remainder made a good recovery.

The second lot consisted of fifty-three head of cattle, all of which, with one exception (an imported animal) had been born and reared on red-water veld. The imported animal was the only one which showed any signs of reaction, but it made a good recovery.

This experience has sufficed to show that it is not always safe to exceed the doses which I have recommended, unless the animals which have been used for withdrawing blood have been untouched for at least a considerable number of months.

I have been able, with the co-operation of several farmers, to carry out experiments by which inoculated cattle have been fully exposed to infection at later dates. In May, 1898, I inoculated ten head of old cattle with blood from an animal which had been inoculated, six months previously, with virulent blood. These cattle were immediately removed from the Institute, and later sent to an infected area in company with ten head of young animals which were uninoculated, but, as is commonly known in this colony, are not so liable to death from this disease as are older animals. Of the young stock all have been infected by exposure in the veld, and three have died. Of the older, more susceptible, animals not one has shown the slightest signs of illness, and the cows have given birth to healthy calves.

Mr. J. H. Webber had twenty-eight head of Fish River cattle inoculated on the 7th November, 1898, and subsequently had them removed to his farm, which is well known to be one of the worst infested areas in the eastern province. Previous experience has shown that if clean cattle are placed there they become very quickly affected with the disease. On the 5th December one died from gall-sickness, but, with this exception, all have done very well, and are at this date in perfect health.

This method of inoculation has proved so satisfactory to the farmers themselves that it is being very generally adopted, and the farmers have petitioned the Government to arrange for an inoculating station being placed at Graham's Town, so that clean cattle coming from clean Karroo areas for transmission to the coast may be inoculated previous to entering the infested belt.

April 27, 1899.

The LORD LISTER, F.R.C.S., D.C.L., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

- I. "Data for the Problem of Evolution in Man. I. A First Study of the Variability and Correlation of the Hand." By Miss M. A. WHITELEY, B.Sc., and KARL PEARSON, F.R.S.
 - II. "On the Luminosity of the Rare Earths when heated *in Vacuo* by means of Cathode Rays." By A. A. CAMPBELL SWINTON. Communicated by LORD KELVIN, F.R.S.
 - III. "On a Quartz-thread Gravity Balance." By RICHARD THRELFALL and J. A. POLLOCK. Communicated by Professor J. J. THOMSON, F.R.S.
 - IV. "On the Electrical Conductivity of Flames containing Salt Vapours." By HAROLD A. WILSON, B.Sc. Communicated by Professor J. J. THOMSON, F.R.S.
 - V. "On a Self-recovering Coherer and the Study of the Cohering Action of different Metals." By Professor JAGADIS CHUNDER BOSE, M.A., D.Sc. Communicated by LORD RAYLEIGH, F.R.S.
 - VI. "On the Presence of Oxygen in the Atmospheres of certain Fixed Stars." By DAVID GILL, C.B., F.R.S.
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